Dr. Babasaheb Ambedkar Technological University (Established a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
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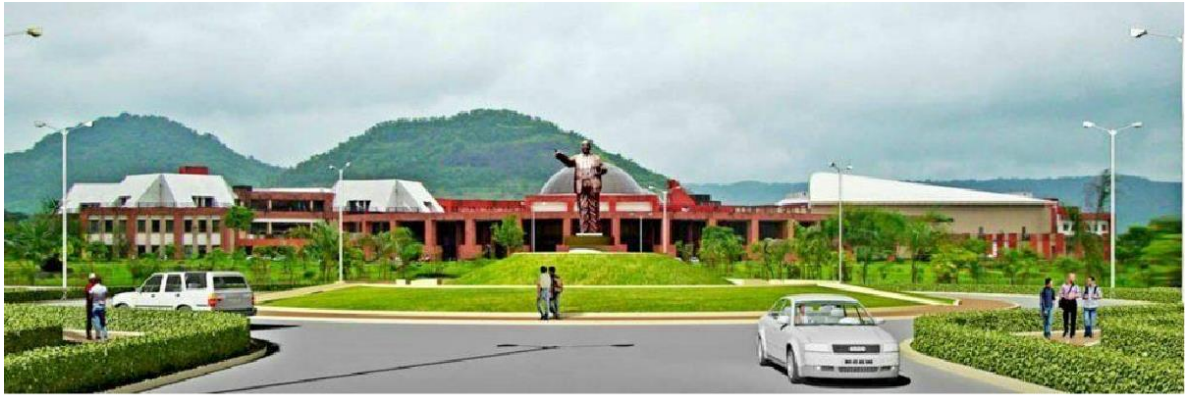
PROPOSED CURRICULUM OF

UNDER GRADUATE PROGRAMME

B. TECH

Electronics Engineering (VLSI Design and Technology)

Second Year [2024-25]
Third Year [2025-26]
Final Year [2026-27]
and onwards



With effective from academic year 2024-25

Rules and Regulations

1. The normal duration of the course leading to B. Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M. Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end- semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full-Time Student of a UG/PG Programme: A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.

4. A student will be permitted to register in the next semester only if he fulfills the following conditions:

(a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination

(b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;

(c) Paid all required advance payments of the Institute and hostel for the current semester;

(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2020-21, starting from I year B. Tech.

Percentage of Marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eight semester of B. Tech Program.

CGPA for pass is minimum 5.0	
CGPA upto < 5.50	Pass class
CGPA ≥ 5.50 & < 6.00	Second Class
CGPA ≥ 6.00 & < 7.50	First Class
CGPA ≥ 7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

1	Mid Semester Exam (MSE) Marks	20
2	Continuous Assessment Marks	20
3	End Semester Examination (ESE) Marks	60

4. A total of 100 Marks for each practical course are distributed as follows:

1.	Continuous Assessment Marks	60
2.	End Semester Examination (ESE)Marks	40

It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.

This will be implemented from the first year of B. Tech starting from Academic Year 2023-24.

5. Description of Grades:

EX Grade: An 'EX' grade stands for outstanding achievement.

EE Grade: The 'EE' grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only. If any of the student remain **absent** for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

6.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA) The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

'n' is the number of subjects for the semester,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his performance as per the above table.

-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he

entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where
'm' is the total number of subjects from the first semester onwards up to and including the semester S,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.
#CGPA will be rounded off to the second place of decimal and recorded as such.

Award of Degree of Honours

Major Degree

The concept of Major and Minors at B. Tech level is introduced to enhance learning skills of students, acquisition of additional knowledge in domains other than the discipline being pursued by the student, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

A. Eligibility Criteria for Majors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for majors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional advanced courses from the same discipline specified in the curriculum. These five courses should be of 4 credits each amounting to 20 credits. The students should complete these credits before the end of last semester.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded B. Tech (Honors) Degree.

B. Eligibility Criteria for Minors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for minors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional courses from other discipline of their interest, which are specified in the respective discipline. These five courses should be of 4 credits each amounting to 20 credits.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded with B. Tech Degree in ------- Engineering with Minor in ---------- Engineering.
(For e.g.: B. Tech in Electronics Engineering (VLSI Design and Technology) with Minor in Computer Engineering).

For applying for Honors and Minor Degree the student has to register themselves through the proper system.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (e.g. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like Medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
    a) If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
    b) The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
    c) In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
3. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.
4. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/ Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.

b) Credits transferred will be considered for overall credits requirements of the programme.

c) Credits transfer can be considered only for the course at same level i. e UG, PG etc.

d) A student must provide all details (original or attested authentic copies) such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g) In exceptional cases, the students may opt for higher credits than the prescribed.

B. Tech. in Electronics Engineering (VLSI Design and Technology)

Different Categories of Courses and Credits for Degree Requirements

a) Humanities and Social Science including Management Courses

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV403	Basic Human Rights	(3-0-0) 3
2	BTEEV505	A. Economics and Management B. Business Communication C. Profession Ethics and Values D. Project Management	(3-0-0) 3
3	BTEEV605	A. Development Engineering B. Employability and Skills Development C. Consumer Behavior	(3-0-0) 3
4	BTEEV706	A. Foreign Language Studies B. Universal Human Values and Ethics C. Intellectual Property Rights	(0-0-4) Audit
TOTAL			**9**

b) Basic Science Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV301	Engineering Mathematics – III	(3-1-0) 4
2	BTEEV404	Probability Theory and Random Processes	(3-0-0) 3
		TOTAL	**07**

c) Engineering Science Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV304	Network Theory & Signal and System	(3-1-0) 4
2	BTEEV305	Python Programming	(3-0-0) 3
3	BTEEV308	Python Programming Lab	(0-0-2) 1
		TOTAL	**08**

d) Professional Core Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV302	Electronic Devices & Circuits	(3-0-0) 3
2	BTEEV303	Digital Electronics & Microprocessor	(3-1-0) 4
3	BTEEV401	Digital System Design using HDL	(3-1-0) 4
4	BTEEV402	Analog Circuits	(3-1-0) 4
5	BTEEV501	Introduction to VLSI Life Cycle & Micro-fabrication	(3-0-0) 3
6	BTEEV502	Microcontroller & Embedded System	(3-1-0) 4
7	BTEEV601	Internet of Things & Industry 4.0	(3-1-0) 4
8	BTEEV602	Digital VLSI Design	(3-0-0) 3
9	BTEEV701	Digital Signal Processing	(3-0-0) 3
10	BTEEV702	Analog VLSI Design	(3-0-0) 3
11	BTEEV703	VLSI Verification & Testing	(3-0-0) 3
12	BTEEV306	EDC Lab	(0-0-2) 1

13	BTEEV307	Digital Electronics & Microprocessor Lab	(0-0-2) 1
14	BTEEV406	Analog Circuits Lab	(0-0-2) 1
15	BTEEV407	Digital System Design using HDL Lab	(0-0-2) 1
16	BTEEV506	Micro-fabrication Design Lab	(0-0-2) 1
17	BTEEV507	Microcontroller & Embedded System Lab	(0-0-2) 1
18	BTEEV606	Digital VLSI Lab	(0-0-2) 1
19	BTEEV707	Digital Signal Processing Lab	(0-0-2) 1
20	BTEEV708	VLSI Verification & Testing Lab	(0-0-2) 1
21	BTEEV709	Analog VLSI Design Lab	(0-0-2) 1
		TOTAL	**48**

e) Professional Elective Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV405	Professional Elective Courses –I A. Analog and Digital Communication B. Electrical Measurement & Instrumentation C. Data Structure & Algorithms using C++ D. Sensors & Actuators	(3-0-0) 3
2	BTEEV408	3. Professional Elective Courses –I Lab A. Analog and Digital Communication B. Electrical Measurement & Instrumentation C. Data Structure & Algorithms using C++ D. Sensors & Actuators	(0-0-2) 1
3	BTEEV503	Professional Elective Course (PEC) -II A. Control System Engineering B. Electromagnetic Field Theory C. High Speed Devices & Circuits D. Semiconductor Device Modeling	(3-1-0) 4
4	BTEEV603	Professional Elective Course (PEC) -III A. Power Electronics & Drives B. Semiconductor Materials Synthesis & Characterization C. Computer Networks D. Introduction to MEMS	(3-1-0) 4
5	BTEEV607	Professional Elective Course (PEC) –III Lab A. Power Electronics & Drives B. Semiconductor Materials Synthesis and Characterization C. Computer Networks D. Introduction to MEMS	(0-0-2) 1
6	BTEEV704	Professional Elective Course (PEC) -IV A. Low Power VLSI Design B. Semiconductor Packaging and Testing C. System on Chip D. Quantum Computing	(3-1-0) 4
		TOTAL	**17**

f) Open Elective Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV504	Open Elective Course (OEC) - I A. Java Programming B. Database Management Systems C. Software Engineering D. Robotics and Automation	(3-0-0) 3
2	BTEEV508	3. Open Elective Course (OEC) – I Lab A. Java Programming B. Database Management Systems C. Software Engineering D. Robotics and Automation	(0-0-2) 1
3	BTEEV604	Open Elective Course (OEC) - II A. Artificial Intelligence & Machine Learning B. Android Programming C. Cloud Computing D. PLC & Automation	(3-0-0) 3
4	BTEEV608	Open Elective Course (OEC) – II Lab A. Artificial Intelligence & Machine Learning B. Android Programming C. Cloud Computing D. PLC & Automation	(0-0-2) 1
5	BTEEV705	Open Elective Course (OEC) -III A. Deep Learning & Data Science B. Linux OS C. Cyber Security D. Advanced Communication Technology	(3-1-0) 4
		TOTAL	**12**

g) Seminar / Mini Project / Internship

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTEEV309	Seminar-I	(0-0-4) 2
2	BTEEV310	Internship –I (Evaluation) / MOOC	Audit
3	BTEEV409	Seminar - II	(0-0-4) 2
4	BTEEV410	Internship –II / MOOC	Audit
5	BTEEV509	Mini Project I	(0-0-4) 2
6	BTEEV510	Internship –II (Evaluation) / MOOC	Audit
7	BTEEV609	Mini Project II	(0-0-4) 2
8	BTEEV610	Internship –III / MOOC	Audit
9	BTEEV710	Project Work	(0-0-4) 2
10	BTEEV711	Internship –IV (Evaluation) / MOOC	Audit
11	BTEEV801	Project Work/ Internship	(0-0-24) 12
		TOTAL	**22**

Category – wise total number of credits

Sr. No	Category	Suggested Breakup of Credits by AICTE	Credits awarded to First year	Credits awarded to Second year to Final Year	Total
1	Humanities and Social Sciences including Management courses	**12***	3	9	**12**
2	Basic Science courses	**25***	18	7	**25**
3	Engineering Science courses including workshop, drawing, basics of electrical / mechanical / computer etc.	**24***	15	8	**23**
4	Professional core courses	**48***	0	48	**48**
5	Professional Elective courses relevant to chosen specialization/branch	**18***	0	17	**17**
6	Open subjects – Electives from other technical and /or emerging subjects	**18***	0	12	**12**
7	Project work, seminar and internship in industry or elsewhere	**15***	1	22	**23**
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]	**NC**	--	--	**--**
	Total	**160***	**37**	**123**	**160**

**Minor variation is allowed as per need of the respective disciplines.*

Suggested Plan of Study

Number of Courses	Semester							
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1	BTBS101	BTBS201	BTEEV301	BTEEV401	BTEEV501	BTEEV601	BTEEV701	BTEEV801
2	BTBS102	BTBS202	BTEEV302	BTEEV402	BTEEV502	BTEEV602	BTEEV702	--
3	BTES103	BTES203	BTEEV303	BTEEV403	BTEEV503 **(PEC-II Elective)**	BTEEV603 **(PEC-III Elective)**	BTEEV703	--
4	BTHM104	BTES204	BTEEV304	BTEEV404	BTEEV504 **(OEC -I Elective)**	BTEEV604 **(OEC -II Elective)**	BTEEV704 **(PEC-IV Elective)**	--
5	BTES105	BTES205	BTEEV305	BTEEV405 **(PEC-I Elective)**	BTEEV505 **(HSSMEC-IV Elective)**	BTEEV605 **(HSSMEC-V Elective)**	BTEEV705 **(OEC -III Elective)**	--
6	BTES106	BTES206	BTEEV306	BTEEV406	BTEEV506	BTEEV606	BTEEV706 **(HSSMEC-VI Elective)**	--
7	BTBS107L	BTBS207L	BTEEV307	BTEEV407	BTEEV507	BTEEV607	BTEEV707	--
8	BTES108L	BTES208L	BTEEV308(Internship –I Evaluation)	BTEEV408 (Internship–II)	BTEEV508 (Internship –II Evaluation)	BTEEV608 (Internship–III)	BTEEV708	--
9	BTHM109L	BTES209S					BTEEV709 (Internship–III Evaluation)	--
10	--	BTES211P (Internship-I)						--

Programme Educational Objectives (PEO)

Name of Programme: B.Tech. Electronics Engineering (VLSI Design and Technology). A graduate in the discipline of VLSI Design and Technology is generally expected to have three kinds of knowledge. First, the graduate should have conceptual knowledge of the core topics of B.Tech. Electronics Engineering (VLSI Design and Technology). Second, she/he should have knowledge of mathematical formalism underlying various programming concepts. Third, graduates in the discipline of B.Tech. Electronics Engineering (VLSI Design and Technology) should have the knowledge of the state of the latest tools and technologies, so that he/she can apply the principles of Electronics Engineering to solve real-life problems from diverse application domains. The programme of B.Tech. Electronics Engineering (VLSI Design and Technology) at Dr. Babasaheb Ambedkar Technological University (DBATU) essentially aims to meet these broad expectations. At the same time, the program intends to comply with the courses and syllabus available at National Program on Technology Enhanced Learning (NPTEL) and SWAYAM. The following specific educational objective aims to achieve these global and regional expectations**.**

Objective Identifier	Objectives
PEO1	Graduates will be able to apply the fundamental concepts of electronics engineering for electronic system design.
PEO2	Graduates will pursue career in VLSI design and allied fields on cutting edge technologies.
PEO3	Graduates will exhibit professional ethics and teamwork in their profession through lifelong learning.

Programme Outcomes (PO)

After undergoing the learning process of four years, students of B.Tech. Electronics Engineering(VLSI Design and Technology) at Dr. Babasaheb Ambedkar Technological University will have an ability to build information systems and provide computer based solutions to real life problems. The graduates of this programme will demonstrate following abilities and skill sets.

Outcome Identifier	Outcomes
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Outcome Identifier	Outcomes
PSO1	Apply knowledge of mathematics and science to solve advanced engineering problems in the areas of micro-electronic devices & circuits, Signal Processing and computation to pursue higher studies.
PSO2	Accomplish advanced practical exposure in the domain of Electronics, IoT and VLSI using contemporary tools and / or equipment's to acquire professional competencies to meet industry standards.

Graduate Attributes / ABET's Criteria

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

(a) Engineering knowledge: An ability to apply knowledge of mathematics, science and engineering.

(b) Problem analysis: An ability to design and conduct experiments as well as to analyze and interpret data.

(c) Design / development of solutions: An ability to design a system, a component, or process, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

(d) Individual and team work: An ability to function on multidisciplinary teams.

(e) Problem Solving: An ability to identify, formulate and solve engineering problems.

(f) Ethics: An understanding of professional and ethical responsibility.

(g) Communication: An ability to communicate effectively.

(h) Environment and sustainability: The broad education necessary to understand the impact of engineeringsolutions in a global, economic, environmental and social context.

(i) Life-long learning: Recognition of the need for and an ability to engage in life-long learning.

(j) A knowledge of technology: Acknowledge of contemporary issues, and state of art technology

(k) Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary forengineering practice.

(l) Project management and finance: Demonstrate knowledge and understanding of the engineering andmanagement principles and apply in multidisciplinary environments.

Mapping of Programme Outcomes with Graduate Attributes / ABET's Criteria

	A	B	C	D	E	F	G	H	I	J	K	L
PO1	X									X		
PO2		X			X							
PO3			X		X							
PO4			X		X							
PO5											X	
PO6					X					X		
PO7								X				
PO8						X						
PO9				X								
PO10							X					
PO11												X
PO12									X			

Course Structure for Second Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester III (Term 3)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	BTEEV301	Engineering Mathematics-III	3	1	-	20	20	60	100	4
2	PCC1	BTEEV302	Electronic Devices & Circuits	3	-	-	20	20	60	100	3
3	PCC2	BTEEV303	Digital Electronics & Microprocessor	3	1	-	20	20	60	100	4
4	ESC11	BTEEV304	Network Theory & Signals and Systems	3	1	-	20	20	60	100	4
5	ESC12	BTEEV305	Python Programming	3	-	-	20	20	60	100	3
6	LC1	BTEEV306	EDC Lab	-	-	2	30	-	20	50	1
7	LC2	BTEEV307	Digital Electronics & Microprocessor Lab	-	-	2	30	-	20	50	1
8	LC3	BTEEV308	Python Programming Lab	-	-	2	30	-	20	50	1
9	Seminar	BTEEV309	Seminar-I	-	-	4	60	-	40	100	2
10	Internship	BTEEV310	Internship –I (Evaluation) / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester III			**15**	**3**	**10**	**250**	**100**	**400**	**750**	**23**

BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course HSSMC = Humanities and Social Science including Management Courses

Course Structure for Second Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester IV (Term 4)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC3	BTEEV401	Digital System Design using HDL	3	1	-	20	20	60	100	4
2	PCC4	BTEEV402	Analog Circuits	3	1	-	20	20	60	100	4
3	HSSMC3	BTEEV403	Basic Human Rights	3	-	-	20	20	60	100	3
4	BSC8	BTEEV404	Probability Theory and Random Processes	3	-	-	20	20	60	100	3
5	PEC-1	BTEEV405	Professional Elective Courses –I	3	-	-	20	20	60	100	3
		BTEEV405A	Analog and Digital Communication								
		BTEEV405B	Electrical Measurement & Instrumentation								
		BTEEV405C	Data Structure & Algorithms using C++								
		BTEEV405D	Sensors & Actuators								
6	LC4	BTEEV406	Analog Circuits Lab	-	-	2	30	-	20	50	1
7	LC5	BTEEV407	Digital System Design using HDL	-	-	2	30	-	20	50	1
8	LC6	BTEEV408	PEC-1 Lab	-	-	2	30	-	20	50	1
9	Seminar	BTEEV409	Seminar - II	-	-	4	60	-	40	100	2
10	Internship	BTEEV410	Internship –II / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester IV			**15**	**2**	**10**	**250**	**100**	**400**	**750**	**22**

Note: The Lab of Professional Elective Courses –I (PEC1) (BTEEVE405) should be conducted as per syllabus contents.

BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course HSSMC = Humanities and Social Science including Management Courses

Course Structure for Third Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester V (Term 5)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC5	BTEEV501	Introduction to VLSI Life Cycle & Micro-fabrication	3	-	-	20	20	60	100	3
2	PCC6	BTEEV502	Microcontroller & Embedded System	3	1	-	20	20	60	100	4
3	PEC-2	BTEEV503	Professional Elective Course (PEC) -II	3	1	-	20	20	60	100	4
		BTEEV503A	Control System Engineering								
		BTEEV503B	Electromagnetic Field Theory								
		BTEEV503C	High Speed Devices & Circuits								
		BTEEV503D	Semiconductor Device Modeling								
4	OEC-1	BTEEV504	Open Elective Course (OEC) - I	3	-	-	20	20	60	100	3
		BTEEV504A	Java Programming								
		BTEEV504B	Database Management Systems								
		BTEEV504C	Software Engineering								
		BTEEV504D	Robotics								
5	HSSMEC-4	BTEEV505	Humanities and Social Sciences including Management Elective Course - I	3	-	-	20	20	60	100	3
		BTEEV505A	Economics & Management								
		BTEEV505B	Business Communication								
		BTEEV505C	Professional Ethics and Values								
		BTEEV505D	Project Management								
6	LC7	BTEEV506	Micro-fabrication Design Lab	-	-	2	30	-	20	50	1
7	LC8	BTEEV507	Microcontroller & Embedded System Lab	-	-	2	30	-	20	50	1
8	LC9	BTEEV508	OEC-1 Lab	-	-	2	30	-	20	50	1
9	PROJ	BTEEV509	Mini Project I	-	-	4	60	-	40	100	2
10	Internship	BTEEV510	Internship –II (Evaluation) / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester V			**15**	**2**	**10**	**250**	**100**	**400**	**750**	**22**

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Course Structure for Third Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester VI (Term 6)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC7	BTEEV601	Internet of Things & Industry 4.0	3	1	-	20	20	60	100	4
2	PCC8	BTEEV602	Digital VLSI Design	3	-	-	20	20	60	100	3
3	PEC-3	BTEEV603	Professional Elective Course (PEC) -III	3	1	-	20	20	60	100	4
		BTEEV603A	Power Electronics & Drives								
		BTEEV603B	Semiconductor Materials Synthesis and Characterization								
		BTEEV603C	Computer Networks								
		BTEEV603D	Introduction to MEMS								
4	OEC-2	BTEEV604	Open Elective Course (OEC) - I	3	-	-	20	20	60	100	3
		BTEEV604A	Artificial Intelligence & Machine Learning								
		BTEEV604B	Android Programming								
		BTEEV604C	Cloud Computing								
		BTEEV604D	PLC & Automation								
5	HSSMEC-5	BTEEV605	Humanities and Social Sciences including Management Elective Course (HSSMEC) - II	3	-	-	20	20	60	100	3
		BTEEV605A	Development Engineering								
		BTEEV605B	Employability and Skill Development								
		BTEEV605C	Consumer Behaviour								
6	LC10	BTEEV606	Digital VLSI Design Lab	-	-	2	30	-	20	50	1
7	LC11	BTEEV607	PEC-3 Lab	-	-	2	30	-	20	50	1
8	LC12	BTEEV608	OEC-2 Lab	-	-	2	30	-	20	50	1
9	PROJ	BTEEV609	Mini Project II	-	-	4	60	-	40	100	2
10	Internship	BTEEV610	Internship –III / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester VI			**15**	**2**	**10**	**250**	**100**	**400**	**750**	**22**

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Course Structure for Final Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester VII (Term 7)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC9	BTEEV701	Digital Signal Processing	3	-	-	20	20	60	100	3
2	PCC10	BTEEV702	Analog VLSI Design	3	-	-	20	20	60	100	3
3	PCC11	BTEEV703	VLSI Verification & Testing	3	-	-	20	20	60	100	3
4	PEC-4	BTEEV704	Professional Elective Course (PEC) -IV	3	1	-	20	20	60	100	4
		BTEEV704A	Low Power VLSI Design								
		BTEEV704B	Semiconductor Packaging and Testing								
		BTEEV704C	System on Chip								
		BTEEV704D	Quantum Computing								
5	OEC-3	BTEEV705	Open Elective Course (OEC) - III	3	1	-	20	20	60	100	4
		BTEEV705A	Deep Learning & Data Science								
		BTEEV705B	Linux OS								
		BTEEV705C	Cyber Security								
		BTEEV705D	Advanced Communication Technology								
6	HSSMEC - 6	BTEEV706	Humanities and Social Sciences including Management Elective Course (HSSMEC) - II	-	-	4	-	-	-	-	Audit
		BTEEV706A	Foreign Language Studies								
		BTEEV706B	Universal Human Value & Ethics								
		BTEEV706C	Intellectual Property Rights								
7	LC13	BTEEV707	Digital Signal Processing Lab	-	-	2	30	-	20	50	1
8	LC14	BTEEV708	VLSI Verification & Testing Lab	-	-	2	30	-	20	50	1
9	LC15	BTEEV709	Analog VLSI Design Lab	-	-	2	30	-	20	50	1
10	PROJ	BTEEV710	Project Work	-	-	4	60	-	40	100	2
11	Internship	BTEEV711	Internship –IV (Evaluation)/ MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester VII			**15**	**2**	**14**	**250**	**100**	**400**	**750**	**22**

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Course Structure for Final Year

B. Tech in Electronics Engineering (VLSI Design and Technology)

Semester VIII (Term 8)											
Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	Project/ Internship	BTEEV801	Project Work/ Internship	-	-	24	60	-	40	100	12
	Total for Semester VIII			**0**	**0**	**24**	**60**	**-**	**40**	**100**	**12**

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Second Year (Semester-III)

Engineering Mathematics-III

BTEEV301	Engineering Mathematics-III	BSC	3L- 1T - 0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20 Marks Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is to:

1. To study transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
2. To study partial differential equations to apply it in computer and electronics engineering.
3. To study Complex functions, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

Course Outcomes: After completion of the course, students will be able to:

CO1	Understand and apply the concepts of Fourier and Laplace transformation.
CO2	Apply the concepts of inverse Laplace Transform with its property to solve Linear Differential Equation with given initial conditions.
CO3	Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
CO4	Understand the concepts of PDE and applications.
CO5	Analyse conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

UNIT-1: Laplace Transform **[09 Hours]**

Definition – conditions for existence ; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by tn, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives; Evaluation of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT-2: Inverse Laplace Transform **[08 Hours]**

Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT-3: Fourier Transform **[07 Hours]**

Definitions – integral transforms; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

UNIT-4: Partial Differential Equations and Their Applications **[09 Hours]**

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}\right)$,and one dimensional wave equation (i.e. $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$.

UNIT-5: Unit 5: Functions of Complex Variables [07 Hours]

Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs)

TEXT BOOKS:

1. Higher Engineering Mathematics,B. S. Grewal ,Khanna Publishers, New Delhi
2. A Course in Engineering Mathematics (Vol III), Dr. B. B. Singh, Synergy Knowledge ware, Mumba
3. A Text Book of Applied Mathematics (Vol I & II), P. N. Wartikar and J.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune
4. Higher Engineering Mathematics, H. K. Das and Er. RajnishVerma ,S. Chand & CO. Pvt. Ltd., New Delhi

REFERENCES:

1. Higher Engineering Mathematics, B. V. Ramana, Tata McGraw-Hill Publications, New Delhi
2. A Text Book of Engineering Mathematics, Peter O' Neil, Thomson Asia Pte Ltd., Singapore
3. Advanced Engineering Mathematics, C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi
4. Integral Transforms and Their Engineering Applications, Dr. B. B. Singh, Synergy. Knowledge ware, Mumbai

Second Year (Semester-III)

Electronic Devices and Circuits

BTEEV302	Electronic Devices and Circuits	PCC1	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1. To introduce static characteristics of ideal two terminal and three terminal devices.
2. To discuss working principle of semiconductor devices such as FET & MOSFET.
3. To explore the applications of amplifier & Oscillator in electronic system design.
4. To explore the use of voltage regulators for power supply design.

Course Outcomes: After completion of the course, students will be able to:

CO1	Explain structure, operation and applications of BJT.
CO2	Evaluate the performance of JFET and MOSFET and apply design concept around it.
CO3	Understand operational concepts/ classification of Power Amplifier.
CO4	Use Transistor as Oscillator and Negative Feedback Amplifier.
CO5	Develop an adjustable voltage regulator circuit.

Course Contents:

UNIT 1: Bipolar Junction Transistor: **[09 Hours]**

BJT: construction, working, characteristics, Transistor as switch, Transistor configurations, current gain equation, stability factor.

BJT Biasing and basic amplifier configurations: Need for biasing BJT, Transistor biasing methods, Transistor as an amplifier, Analysis of Single Stage Amplifier, RC coupled Amplifiers.

UNIT 2: Junction Field Effect Transistor and MOSFET **[08 Hours]**

FET-Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison.

MOSFET-Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters.

UNIT 3: Power amplifiers: **[07 Hours]**

Introduction, classification of power amplifiers-Class A, B, AB, C and D, transformer coupled class A Amplifier, Class B push pull and complementary symmetry amplifier, efficiency, calculation of Power output, power dissipation, cross over distortion, need of heat sink.

UNIT 4: Feedback amplifiers & oscillators (transistorized): **[08 Hours]**

Feedback amplifiers: Feedback concept and topologies, Effect of feedback on terminal characteristics of amplifiers.

Oscillators: Basic principle of sinusoidal oscillation, RC phase-shift oscillator, wien-bridge oscillator; LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillator.

Unit 5: Voltage Regulator: **[08 Hours]**

Regulator using 78XX, 79XX, Voltage regulator using IC317, Block schematic of regulator IC 723, regulated power supply using IC 723, short circuit protection, switch mode power supply.

Text book:

1. Millman Halkias, –Integrated Electronics-Analog and Digital Circuits and Systems‖, Tata McGraw Hill, 2000.
2. Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, “Electronics Devices & Circuits”, Synergy Knowledgeware Mumbai, 2017. ISBN:9789383352616
3. Anil K. Maini and Varsha Agarwal “Electronic Devices and Circuits”, Wiley India

Reference book:

1. R. L. Boylstad, L. Nashlesky, “Electronic Devices and circuits Theory”, 9thEdition, Prentice Hall of India, 2006.
2. D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997. 4. David A. Bell, “Electronic Devices and Circuits”,5th Edition, Oxford Press
3. David A.Bell,“ElectronicDevicesandCircuits”,5th Edition, Oxford press
4. Phillip E. Allen, Douglas R. Holberg, “CMOS Analog Circuit Design”, Second Edition,

   Oxford

Second Year (Semester-III)

Digital Electronics and Microprocessor

BTEEV303	**Digital Electronics & Microprocessor**	**PCC2**	**3L- 1T - 0P**	**4 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20 arks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1. To provide a strong foundation of fundamental basics of Digital Electronics & microprocessor
2. To demonstrate awareness and fundamental understanding of various Combinational and sequential circuits
3. To impart knowledge about microprocessor.

Course Outcomes: After completion of the course, students will be able to:

CO1	Became familiar with the digital signal, positive and negative logic, Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from others
CO2	Learn the working mechanism and design guidelines of different combinational Circuits and their role in digital system design.
CO3	Understand the working mechanism and design guidelines of different sequential circuits and their role in the digital system design
CO4	Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's internal architecture and its operation within the area of manufacturing and performance
CO5	Describe, list and use memory mapping and address decoding technique. Develop assembly language programs for microprocessor and its peripherals.

Unit 1: Introduction **[09 Hours]**

Boolean Algebra, Laws of Boolean Algebra, Number systems and their conversions, Excess-3 code, Gray code, 1s & 2s complement, Logic gates, Standard form of logic functions, K-Map up to 4 variables, Don't Care Condition and its effect, Simplification of logic expressions using K-Map & its realization.

Unit 2: Combinational Circuits **[08 Hours]**

Combinational logic design using 74XX/54XX MSI chip series concerning to MUX, DEMUX, Adder, Decoders, Code Converters, Comparators, Parity Generator/Checker, Encoders, Priority Encoder and BCD to Seven Segment Decoder.

Unit 3: Sequential circuits and systems **[07 Hours]**

1-bit memory cell, Types of flip flops: R-S, J-K, Master slave J-K, D-type, T-type. Clocked SR FF, Use of preset and clear terminals, Shift Register & its types. Clock: Level & Edge Triggering, Counters: Asynchronous and Synchronous counter, up/down counter. Finite State Machines (FSM) Models – Moore and Mealy.

Unit 4: Fundamentals of Microprocessors **[08 Hours]**

8085: Pin configuration, Architecture, Register Structure, addressing modes, Instruction set of 8085, Timing diagrams (OF, MR, MW, IOR, IOW only), Interrupts (software and hardware interrupts).

Unit 5: Programming & Interfacing **[08 Hours]**

Assembly Language Programming of 8085, Stack, Subroutine. Address space partitioning schemes: Memory mapped I/O and I/O mapped I/ O, Address decoding techniques. Interfacing of 8085 with: 8255, 8253/54, Concept of DMA **(Only Simple Programming Examples on 8085 & its Interfacing is expected).** Architecture of 8086.

Text Book:

1. R. P. Jain, Modern Digital Electronics, McGraw Hill Education, 2009.
2. Digital Logic and Computer Design by Moris Mano, Pearson , ISBN 978-93-325-4252-5
3. Ramesh Gaonkar, Microprocessor Architecture, programming andapplications with 8085, PENRAM

Reference Books:

1. M. M. Mano, Digital logic and Computer design, Pearson Education India,2016.
2. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.
3. Douglas Hall, Microprocessors and Interfacing, McGraw-HillPublication, Revised 2nd Edition, 2006
4. Anil Maini, ―Digital Electronics: Principles and Integrated Circuits‖, Wiley India Ltd, ISBN:978- 81-265-1466-3

Second Year (Semester-III)

Network Theory & Signals and Systems

BTEEV304	Network Analysis & Signals and Systems	ESC11	3L- 1T - 0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1. To develop skills for analysis of linear circuits using nodal analysis, mesh analysis and network theorems.
2. To illustrate the concept of graph theory used for networks analysis.
3. To demonstrate a comprehensive understanding of various parameters used to characterize two-port networks.
4. To emphasise on the fundamental characteristics of signals and systems.
5. To explore the need of Laplace transform and develop the ability to analyze the systems in s-domain.

Course Outcomes: After completion of the course, students will be able to:

CO1	Analyze electrical circuits using Mesh Analysis , Node analysis and network theorems.
CO2	Determine network currents and voltages using Graph Theory approach.
CO3	Apply the concept of Two-Port network theory for electrical network analysis
CO4	Understand the classification of signals and systems.
CO5	Analyze Linear Time Invariant (LTI) systems in Laplace Domain.

UNIT-1: **[09 Hours]**

Node and Mesh analysis: Circuit components, Types of Sources, Source transformation, Kirchhoff's laws, Node and Mesh analysis.

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem and Maximum power transfer theorem

Unit-2 Graph theory and network equations: **[08 Hours]**

Graph of a network, Trees, Co-trees and loops, Incidence matrix, Tie set and Cut set of a network, Analysis of a network using Tie set and Cut set matrix, Network equilibrium equations (without magnetic coupling), Duality.

UNIT-3: Two Port Networks: **[07 Hours]**

Two port Network: Open circuit impedance parameters (Z), Short circuit admittance parameters (Y), Transmission parameters (ABCD), Hybrid parameters (H), and reciprocity and symmetry conditions. Interconnection of two port networks: Parallel, Series and Cascade connection of two port networks, T and π representation, Terminated 2 port networks.

UNIT-4: **[08 Hours]**

Signals and systems as seen in everyday life, and in various branches of engineering and science. Classification of Signals in continuous time: continuous and discrete time signals, continuous and discrete amplitude signals, deterministic and random signals, periodic and non-periodic signals, Energy and power

signals. Elementary Signals: Unit impulse, step, ramp, exponential, Classification of systems in continuous time, LTI systems.

UNIT-5: **[08 Hours]**

Laplace Transform: Laplace Transform, Region of convergence, Inverse Laplace transforms Application of Laplace transform for determination of solution of differential equation and systems realization up to second order, analysis of RC, RL and RLC networks. Frequency response of LTI system.

TEXT BOOKS:

1. Valkenburg, “Network Analysis”, PHI Pbs.
2. D. Roy Choudhary, “Networks and Systems” New Age International Publishers.
3. Dr. S. L. Nalbalwar, A.M. Kulkarni and S.P. Sheth, “Signals and Systems”, 2nd Edition, Synergy Knowledgeware, 2017

REFERENCES BOOKS:

1. Kelkar, Pandit, “Linear Network Theory”, Pratibha Publication.
2. “Network Analysis And Synthesis”, Wadhwa, New Age Pbs
3. “Introduction to Network Synthesis”, Valkenburg, PHI Pbs.
4. Sudhakar, A. Shyammohan, “Circuits and Network”, Third Edition, 2006, Tata McGraw Hill.
5. R. Anand, Signals and Systems, Khanna Publishing House, 2019.
6. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
7. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
8. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
9. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.

Second Year (Semester-III)
Python Programming

BTEEV305	Python Programming	ESC12	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1. To provide a strong foundation of fundamental basics of programming using python.
2. To demonstrate awareness and fundamental understanding of various data types in python.
3. To explain python programming for the networking and GUI applications.
4. To test Python programs for given data.

Course Outcomes: After completion of the course, students will be able to:

CO1	Develop small programs to demonstrate use of python tokens in IDE.
CO2	Develop python program to demonstrate use of operators, control flow and sequences.
CO3	Develop python function for a given problem.
CO4	Develop python program to demonstrate use of classes and objects.
CO5	Develop python program to demonstrate networking, make database connectivity and use GUI tools.

Unit-1: Introduction and Python Installation **[09 Hours]**

Introduction: History of Python, Need of Python, Features of Python, Comparison with C and Java, Python Building Blocks: Keywords, Identifiers, Variables, Comments, Docstring, Indentation, Input-Output.

Python Installation: Python Installation with 3.x version, Working with various IDE: Command Prompt, IDLE, Jupyter Notebook, Google Colab, Pycharm, VS Code, Spyder.

Unit-2: Data Types, Operators and Control Flow **[08 Hours]**

Python Data Types: Numbers, Strings, Sequences, Declaration and Initialization.

Operators in Python: Arithmetic, Relational, Assignment, Logical, Bitwise, Membership, Identity, Operator Precedence & Associativity.

Control Flow- if, if-elif-else, nested if-else, Loops: for, while loop, Loops using break, continue, pass.

Python Data Structures: List, Tuple, Set, Dictionary, Slicing and Comprehension operations using sequences.

Unit 3: Python Functions, Modules and Packages **[07 Hours]**

Python built-in functions, Math Function, Python user-defined functions, Arguments: Actual & Formal,

Default Argument, Positional Argument, Variable Length Argument, Function returning value/s, Anonymous Functions. Scope of variable: Global and Local.
Creating modules, import statement, from. Import statement, name spacing, Python packages, Introduction to PIP, Installing & Uninstalling Packages via PIP, Using Python Packages.

Unit-4: OOPS and Exception Handling **[08 Hours]**

Classes and Objects, Self-variable, Methods, Constructor Method, Encapsulation, Inheritance, Polymorphism, Abstraction, Data Hiding, Method Overloading and Overriding.
Exception Handling: Errors & Exceptions, Difference between Error and Exception, Exception Handling using try-except-finally blocks, Raising Exception, Exception Types: Built-in & User-defined Exceptions.

Unit-5: Networking and Miscellaneous **[08 Hours]**

Python Network Programming: Python The socket Module, Server Socket Methods, Client Socket Methods, Python Libraries for Telecom Engineers, Sionna Python Framework.
Miscellaneous
Database Connectivity using python, GUI Programming, Turtle Graphics, TKinter
Data Compression: Need, Types.
Testing: Need, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

Text Books

1. "Core Python Programming" by Dr. R. Nageswara Rao, Dreamtech Press.
2. "Python Programming: A Modern Approach", Vamsi Kurama, Pearson.
3. "Think Python", Allen Downey, Green Tea Press.
4. "Learning Python", Mark Lutz, Oroelly Publications.
5. "Let Us Python" Yashwant Kanetkar, 4th Edition, BPB Publications.

Reference Books

1. The Complete Reference: Python- Martin C. Brown, McGraw Hill Publication.
2. Python Essential Reference, Developer's Library, David M. Beazley, 4th Edition, Addidion-Wesely Professional, ISBN: 9780672329784

COURSE CURRICULUM MAPPING WITH MOOC PLATFORM NPTEL

Sr. No	Name of Subject as per Curriculum	Course Code	Semester	SWAYAM/ NPTEL Course And Web Link	Name of Institute offering course	Relevance %	Duration of Course
1.	Python Programming	BTECE403	Fourth	The Joy of Computing using Python	IIT Ropar		12 Weeks

Second Year (Semester-III)

Electronic Devices & Circuits Lab

BTEEV306	**Electronic Devices & Circuits Lab**	**LC1**	**0L-0T-2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

Electronic Devices & Circuits Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Study of Digital multimeter, Function Generator, CRO/DSO, Dual power supply, connecting probes.
2. Study and Experiment on BJT (Reading data sheet, Terminal Identification, packages, testing & Plot BJT characteristics)
3. Study and Experiment on FET (Reading data sheet, Terminal Identification, packages, testing & Plot FET characteristics)
4. Study and Experiment on MOSFET (Reading data sheet, Terminal Identification, packages, testing &Plot MOSFET characteristics
5. To study & perform Class A amplifier.
6. To study & perform Voltage series feedback amplifier.
7. To study & Perform RC phase shift oscillator.
8. To study & perform Colpitts, Hartley oscillator.
9. To study regulated DC power supply using discrete components and plot its line and load regulation characteristics.
10. To study the Current Series Feedback amplifier.
11. To study the diode as a clipper and clamper.
12. Mini project.

Second Year (Semester-III)

Digital Electronics & Microprocessor Lab

BTEEV307	**Digital Electronics & Microprocessor Lab**	**LC2**	**0L-0T-2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

Digital Electronics and Microprocessor Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1) To Perform experiment on basic and universal logic gates and verify their truth table.
2) To Perform experiment to count the number of clock cycles using counter.
3) To perform code conversion operation: binary to Gray and Gray to binary operation.
4) To perform experiment for verifying the operation of different Flips Flops SR, JK, D and T Type.
5) To perform experiment for verifying the operation of clocked SR flip flop with Preset and clear.
6) To perform experiment on Shift resisters.
7) To design four bit binary comparator.
8) To design parity generator and parity checker.
9) To perform experiment on Multiplexer and Demultiplexer/Decoder using MSI chips.
10) Write a program to perform addition of 10 data bytes using 8085.
11) Write a program to calculate no. of 1s in given 8-bit data using 8085.
12) Write a program for interfacing of LED to 8085 microprocessor.
13) Write a program for interfacing of 8255 to 8085 microprocessor.
14) Write a program to interface 8253/54 with 8085 to generate a square wave.

Second Year (Semester-III)

Python Programming Lab

BTEEV308	**Python Programming Lab**	**LC3**	**0L-0T-2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

Python Programming Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. To Study Python Installation in Windows operating system and Practice Execution of python statements in REPL (Shell) & IDLE.
2. To write & perform python program using operators.
3. To perform Python program to demonstrate use of conditional statements.
4. To perform Python program to demonstrate use of looping statements.
5. Write Python program to perform various operations on Lists and Tuples.
6. Write Python program to perform various operations on Sets and Dictionaries.
7. Develop user defined Python function & module for given problem.
8. Demonstration of Object Oriented concepts
   i. Classes and Objects
   ii. Inheritance
   iii. Polymorphism
   iv. Method Overloading
9. Demonstration of Exception handling in Python.
10. Perform CRUD Operation using database in python.
11. Building your first Python GUI Application using TKinter
    i. Displaying Text and Images With Label Widgets
    ii. Displaying Clickable Buttons With Button Widgets
    iii. Getting User Input With Entry Widgets
12. Demonstration of simple Server-Client Program using Python

Second Year (Semester-III)

Seminar-I

BTEEV309	**SEMINAR- I**	**Seminar**	**0L-0T-4P**	**2 Credits**

Guidelines for Seminar

The students shall study in group of two members (or individual) on some special topic beyond the scope of the syllabus under the subjects of Electronics Engineering, Computer Science Engineering Artificial Intelligence, Data Science, or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher. The students shall prepare his report and deliver talk on the topic for other studentsof his class in the presence of his guide and internal examiner. The student is permitted to use audio-visual aids or any other such teaching aids.

Continues Assessment:

The Continues Assessment for this head will consists of the report written in a technical reporting manner and presentation of the talk on the subject and will be assessed by the internal examiner appointed by the HOD of concern department of the institution.

Second Year (Semester-III)
Internship – I

BTEEV310	**Internship- I**	**Internship**	**0L-0T-0P**	**Audit**

Guidelines for Internships

Guidelines for Field Training / Internship / Industrial Training Industrial Training:

1. To apply for a suitable Industrial Training, submit an application form to respective Organization concerned one semester before the Industrial Training Programmed commences.
2. Student can also apply through online platforms such as Internshala for industrial training.
3. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).
4. To complete the Industrial Training process within the specified time based on the Industrial Training Programme schedule.
5. Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Program.
6. Evaluation of the students' performance should be done in the next upcoming semester.
7. Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.

Second Year (Semester-IV)

Digital System Design using HDL

BTEEV401	Digital System Design using HDL	PCC3	3L- 1T - 0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20 Marks Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1	To use the industry-standard hardware description language VHDL into the digital design process.
2	To design VHDL models ranging in complexity from a simple adder to more complex circuits.
3	To understand the synthesis and testing of the models.

Course Outcomes: After completion of the course, students will be able to:

CO1	Remember the Boolean laws, truth tables & standard forms of logic functions used in Digital Design.
CO2	Understand the FSM, state diagram and asynchronous sequential networks.
CO3	Write the codes for basic combinational and sequential circuits using VHDL.
CO4	Apply the knowledge of PLDs for analysing logic functions.
CO5	Design simple digital circuits based on FPGA.

UNIT-1: Digital Logic Design Fundamentals **[09 Hours]**

Review of Logic Design Fundamentals: 5 Variable K-map, Quine-McCluskey method, Designing with NAND and NOR gates, Truth Tables and Excitation tables of Flip- flop: SR, JK, D, T; Conversion from one type to another type of Flip Flop. Ring counters, BCD counter, Half adder & full adder.

UNIT-2: State Machines **[08 Hours]**

Finite State Machines (FSM) Models – Moore and Mealy, Design Procedure, State diagram, deviation of state graphs and tables, reduction of state assignments, Sequence generator and detector, SM Charts. Asynchronous sequential networks: Primitive flow tables, hazards.

UNIT-3: VHDL & Basics of Verilog **[07 Hours]**

VHDL: Design flow, EDA tools, code structures, modelling styles, data types, operators and attributes. Signals & Variables, Statements used in data flow & behavioral modelling styles. Introduction to VERILOG, Levels of Design and code structure.

UNIT-4: Programming using VHDL **[08 Hours]**

Design of combinational blocks such as multi-bit adders, ALU, MUX, encoders, decoders, Design of sequential circuits, state machine modeling (Moore and Mealy machines). Common VHDL programming Errors.

UNIT-5: Introduction to Programmable Logic Devices **[08 Hours]**

Combinational Logic Design using ROM array, PLA, PAL, General Architecture of FPGA, FPGA architecture modules their meaning & usage, Programming platforms, Programmable Interconnects, Programmable I/O Blocks, Applications of FPGAs, Design Flow for FPGAs. Implementing simple functions using FPGAs.

TEXT BOOKS:

1. Digital Systems Design using VHDL", Charles H. Roth, Jr., The University of Texas at Austin. 2006 reprint, Thomson Asia Pte Ltd, Singapore
2. "HDL Programming VHDL and Verilog", Nazeih M. Botros, 2009 reprint, Dreamtech Press.
3. Stephen Brown, ZvonkoVranesic, ―Fundamentals of Digital Logic with VHDL Design‖, McGraw-Hill, ISBN–13:978-1-25-902597-6.

REFERENCES:

1. "VHDL for Programmable Logic", Kevin Skahill, Pearson education, 2006.
2. "Fundamentals of Digital Logic with VHDL Design", Stephen Brown and Zvonko Vranesic, McGraw-Hill Higher Education.
3. Anil Maini, ―Digital Electronics: Principles and Integrated Circuits‖, Wiley India Ltd, ISBN:978-81-265-1466-3.
4. Norman B & Bradley, ―Digital Logic Design Principles, Wiley India Ltd, ISBN:978-81- 265-1258-4

Second Year (Semester-IV)
Analog Circuits

BTEEV402	**Analog Circuits**	**PCC4**	**3L- 1T - 0P**	**4 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To demonstrate the different stages in Op-Amp and its working principle.
2	To explore various op-amp parameters and their significance.
3	To discuss the frequency response, transient response and frequency compensation techniques for Op-Amp.
4	To illustrate various linear and nonlinear applications of Op-Amp.
5	To explain the functionalities of PLL and its use in various applications in communication and control systems.

Course Outcomes: After completion of the course, students will be able to:

CO1	Understand the working of OP-AMP and parameters of IC 741.
CO2	Apply the knowledge of IC 741 for designing simple linear applications.
CO3	Design square wave generator and active filters using OP-AMP.
CO4	Understand the working of IC 555 and its use for waveform generation.
CO5	Explain the concept of PLL & its application.

Course Contents:

Unit 1: OP-AMP Basics **[09 Hours]**

Block diagram of OP-AMP, Differential Amplifier configurations, current mirror circuit, level shifting, transfer- characteristics, frequency response, study of IC 741, OP-AMP parameters, offset nulling and their importance. Voltage series and voltage shunt feedback amplifier and its effect on Ri, Ro, bandwidth and voltage gain.

Unit 2: Linear Applications of OP-AMP **[08 Hours]**

Inverting and Non-inverting amplifier, voltage follower, Summing, averaging, scaling amplifier, Differentiator, Integrator, Instrumentation amplifiers, voltage to current converter, frequency to voltage and voltage to frequency converter.

Unit 3: Non-linear Applications of OP-AMP & Active Filters **[09 Hours]**

Comparator, window detector, Schmitt trigger, astable, monostable and bistable multivibrator, triangular wave generator, clippers and clampers.

Active filters: LPF, HPF, BPF, Band Stop Filters, 1st and 2nd order Butterworth filters using op-amp.

UNIT 4: Timers **[08 Hours]**

Timers: Block schematic of IC555, Pin configuration of IC555, application of timer 555 as astable, monostable and bistable multivibrators, frequency divider, sawtooth generator, free running ramp generator.

Unit 5: Phase Locked Loop **[07 Hours]**

Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC-LM 565 and its applications as FM detector and frequency translator, VCO.

TEXT BOOKS

1. Ramakant A. Gaikwad, Op Amps and Linear Integrated Circuits‖, Pearson Education 2000.
2. Salivahanan and Kanchana Bhaskaran, Linear Integrated Circuits‖, Tata McGraw Hill, India 2008.
3. Bali, Linear Integrated Circuits, McGraw Hill 2008.

REFERENCE BOOKS

1. George Clayton and Steve Winder, Operational Amplifiers‖, 5th Edition Newnes.
2. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits‖, Tata McGraw Hill.
3. Gray, Hurst, Lewise, Meyer, Analysis & Design of Analog Integrated Circuits, Wiley Publications on Education.
4. Matt Weisfeld, the Object-Oriented Thought Process, Pearson.
5. Cox Brad, Object –Oriented Programming: An Evolutionary Approach, Addison –Wesley.

Second Year (Semester-IV)

Basic Human Rights

BTEEV403	Basic Human Rights	HSSMC3	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To train the young minds facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture
2	To give knowledge of the major "signposts" in the historical development of human rights,the range of contemporary declarations, conventions, and covenants
3	To enable them to understand the basic concepts of human rights (including also discrimination, equality, etc.), the relationship between individual, group, and national rights
4	To develop sympathy in their minds for those who are denied rights
5	To make the students aware of their rights as well as duties to the nation

Course Outcomes: After completion of the course, students will be able to:

CO1	Understand the history of human rights
CO2	Learn to respect others caste, religion, region and culture.
CO3	Aware of their rights as Indian citizen
CO4	Understand importance of constitution of India for individual and communities in the society
CO5	Realize the philosophical and cultural basis and historical perspectives of human rights

UNIT 1: The Basic Concepts: **[09 Hours]**

Individual, group, civil society, state, equality, justice. Human Values, Human rights and Human Duties: - Origin, Contribution of American bill of rights, French revolution. Declaration of independence, Rights of citizen, Rights of working and exploited people.

UNIT 2 Fundamental rights and economic program: **[08 Hours]**

Society, religion, culture, and their inter relationship. Impact of social structure on human behavior, Social Structure and Social Problems: - Social and communal conflicts and social harmony, rural poverty, unemployment, bonded labor.

UNIT 3: Migrant workers: **[07 Hours]**

Migrant workers and human rights violations, human rights of mentally and physically challenged. State, Individual liberty, Freedom and democracy. NGOs and human rights in India: - Land, Water,Forest issues.

UNIT 4: Human rights in Indian constitution and law **[09 Hours]**

i) The constitution of India: Preamble
ii) Fundamental rights.

iii) Directive principles of statepolicy.
iv) Fundamental duties.
v) Some other provisions.

UNIT 5: Universal declaration: [07 Hours]

Universal declaration of human rights and provisions of India. Constitution and law. National human rights commission and state human rights commission

Text Books: -

1. M. Laxmikanth, “Indian Polity”, McGraw Hill Publication.
2. D. Basu, Introduction to the Indian Constitution of India, (20th Ed.2009).
3. ABC Teaching of Human Rights: Centre for Human Rights, UN Publication, NewYork, 1989

Reference Book: -

1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005.
2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.
3. Leah Levin: Human Rights (Questions and Answers) National Book Trust India, New Delhi, 1992.
4. Justice D.M. Dharmadikari: Human Values and Human Rights: Universal Publications, New Delhi,2010.
5. Rokeah,M: The Nature of Human Values, New York: The Free Press, 1973.

Second Year (Semester-IV)

Probability Theory and Random Processes

BTEEV404	**Probability Theory and Random Processes**	**BSC8**	**3L- 0T - 0P**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To develop basic of statistics, probability and random variables.
2	To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in engineering and applied science.

Course Outcomes: After completion of the course, students will be able to:

CO1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon
CO2	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications
CO3	Apply the concept correlation and spectral densities in engineering discipline.
CO4	Understand and apply the concept of linear regression analysis.
CO5	The students will have an exposure of various distribution functions and help in acquiringskills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems

Course Contents:

UNIT 1: Probability Theory **[07 Hours]**

Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes theorem of inverse probability, Properties of probabilities with proofs, Examples.

UNIT 2: Random Variable and Mathematical Expectation **[08 Hours]**

Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs. Theoretical Probability Distributions : Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

UNIT 3: Correlation **[09 Hours]**

Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl

Pearson's correlation coefficient, Spearman‘s rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman‘s rank correlation coefficient, Probable errors.

UNIT 4: Linear Regression Analysis **[08 Hours]**

Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

UNIT 5: Estimation and Hypothesis **[08 Hours]**

Estimation, Large Sample Estimation of a Population Mean, Small Sample Estimation of a Population Mean, Large Sample Estimation of a Population Proportion, Sample Size Considerations, Testing Hypotheses, The Elements of Hypothesis Testing, Large Sample Tests for a Population Mean, The Observed Significance of a Test, Small Sample Tests for a Population Mean, Large Sample Tests for a Population Proportion.

Text Books

1. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016.
2. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010.
3. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, Wiley Publication, 2nd Edition, 2001.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
3. G. Haribaskaran, Probability, Queuing Theory and Reliability Engineering, Laxmi Publications,2nd Edition, 2009.
4. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines,4th Edition, 2013.
5. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001.
6. Roxy Peck, Chris Olsen, Jay Devore, Introduction to Statistics and Data Analysis, Third Edition, Thomson Books/Cole.
7. Ronald Walpole; Raymond Myers; Sharon Myers; Keying Ye, Probability & statistics for engineers& scientists, 9th edition, Prentice Hall.

Second Year (Semester-IV)
Professional Elective-I

Analog & Digital Communication

BTEEV405A	Analog & Digital Communication	PEC-1	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1	To introduce concept of AM, FM, generation and reception.
2	To brief the impact of noise on AM, FM systems.
3	To make students aware of various techniques of digital transmission and reception.
4	To make students familiar about the concept of Passband modulation and demodulation techniques.

Course Outcomes: After completion of the course, students will be able to:

CO1	Summarize the various AM generation techniques and characteristics of receiver.
CO2	Understand the principle of FM transmission and reception.
CO3	Examine the impact of noise in an analog communication system.
CO4	Correlate the different digital data transmission and their performance.
CO5	Express the types and applications of multiple access techniques.

UNIT 1: AM Transmission & Reception **[09 Hours]**

Block diagram of communication system, Modulation, need of modulation,.

AM Transmitters: AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Generation of DSB-SC by using balanced modulator (FET & Diodes), Generation of SSB-SC by third method (weavers).

AM Receivers: Characteristics: Selectivity, sensitivity, fidelity, Image frequency & rejection ratio, Block diagram of Super-heterodyne receiver (without detail structure of each block). **(Simple numerical expected only on topic Modulation Index and characteristics of Radio Receiver).**

UNIT 2: FM Transmission & Reception **[08 Hours]**

FM Transmitters : FM Modulation, Frequency Spectrum, Direct FM generation using FET and varactor diode, Indirect FM generation, Narrow Band and Wide Band FM, pre-emphasis and De- emphasis.

FM Receivers: Block diagram of FM receiver, Foster Seeley Discriminator.

UNIT 3: Basics of Antenna and Noise **[07 Hours]**

Antenna Basics, Principle of radiation, antenna power gain, beam width, bandwidth and radiation resistance, Isotropic radiator **(No numerical expected till this point).**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, Low frequency or flicker noise, burst noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

UNIT 4: Digital Transmission **[08 Hours]**

Functional Blocks of Digital Communication System, Sampling Theorem, Sampling of Band-Pass Signal, Quantization, Aliasing effect, PCM, Delta Modulation, TDM, FDM.

Passband Modulation: ASK, FSK, PSK, Generation, reception and Signal space diagram of BASK, BFSK, BPSK, QPSK. **(No numerical and derivation expected till this point).**

Equalization: Need for equalization; Transversal Equalizer, Scrambler & Unscrambler.

UNIT 5: Multiple Access Schemes and Spread Spectrum Communication **[08 Hours]**

TDMA, FDMA, CDMA.

Spread Spectrum Systems: Notion of Spread Spectrum; PN Sequence Generation; Direct Sequence Spread Spectrum (DSSS); Jamming Margin; Processing Gain; Eb/No Ratio; Frequency Hopped Spread Spectrum; Slow and Fast frequency Hopping **(No numerical expected in this unit except on topic PN Sequence).**

Text Books:

1. B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press, 3rd Edition, 1998.
2. Simon Haykin, Communication Systems, John Wiley & Sons, 4th Edition, 2000.
3. Simon Haykin, Michael Moher, “Introduction to Analog and Digital Communications” John Wiley & Sons, Second Edition, 2007.

Reference Books:

1. Dennis Roddy & Coolen, Electronic Communication, Prentice-Hall, 4th Edition, 2008.
2. George Kennedy, Electronic Communication Systems, McGraw-Hill, 4th Edition, 2009.
3. Taub& Schilling, Principles of Communication Systems, Tata McGraw-Hill, 3rd Edition, 2011.
4. Frenzel, "Principles of Electronic Communication Systems", Tata McGraw-Hill, 3rd Edition, 2008.
5. Bernard Sklar, Fred Harris, “Digital Communications Fundamentals and Applications”, Pearson Education, 3rd Edition, 2021.
6. J. G. Proakis and M. Salehi, Digital Communications, McGraw-Hill, 5th edition, 2014.
7. A.B Carlson and P.B. Crilly, “Introduction to Digital Communication”, McGraw-Hill, 5th edition, 2015.
8. U.A Bakshi, A.P Godse, “Analog Communication” Technical Publication Pune.
9. U.A Bakshi, A.P Godse, “Communication Engineering” Technical Publication.
10. Dr. J. S. Chitode “DIGITAL COMMUNICATION” Technical Publication.
11. U.A Bakshi, A.P Godse, Dr. J. S. Chitode, “Analog Communication Systems” First Edition Technical Publication.
12. K. Sam Shanmugan, “Digital and Analog Communication Systems”, WILEY-INDIA Edition.

Second Year (Semester-IV)

Electrical Measurement & Instrumentation

BTEEV405B	**Electrical Measurement & Instrumentation**	**PEC-1**	**3L- 0T - 0P**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1	To determine the parameters of AC, DC machines.
2	To identify & solve the problems related AC/DC machines.

Course Outcomes: After completion of the course, students will be able to:

CO1	Discuss the classification of instruments and their characteristics.
CO2	Demonstrate the use measuring instruments for measurement of electrical quantities.
CO3	Apply the different methods for measuring the value of resistance and capacitance.
CO4	Explore the various types of sensors and transducers.
CO5	Apply the knowledge of sensors and transducers for developing simple applications.

UNIT-1: Introduction of Measurement **[07 Hours]**

Philosophy of Measurement- Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis.

UNIT-2: Analog Measurement of Electrical Quantities **[08 Hours]**

Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electro dynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors & remedies in wattmeter and energy meter. Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

UNIT-3: Measurement of Parameters **[09 Hours]**

Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q Meter, Digital Measurement of Electrical Quantities-, block diagram Study of digital voltmeter, frequency meter, Power Analyzer and Harmonics Analyzer; Electronic Multimeter.

UNIT-4: Sensors and Transducers **[08 Hours]**

Classification and selection of sensors and transducers, strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types.

UNIT-5: Industrial Measurement and Industrial Applications **[08 Hours]**

Measurement of vibration, electrical telemetry thickness, humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, object counter level measurement, on /off timers, RTC, sound level meter, Recorder X- Y plotters and its applications.

TEXT BOOKS:

1. A course in Electrical and Electronic Measurement and Instrumentation" by K.Sawhney (Publisher name: Dhanpat Rai &Co.)
2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
4. Electrical Machines and Instruments by Dr.Syeda Sumera Ali & Prof.Prabhakar Keni.

REFERENCES

1. Electronic Measurements and Instrumentation: JNTU" by K Lal Kishore
2. A Course in Elec. & Electronics Measurements & Instrumentation: A K. Sawhney
3. Modern Electronic Instrumentation and Measurement Techniques: Helfrick & Cooper
4. Electrical Measurement and Measuring Instruments - Golding & Waddis

Second Year (Semester-IV)

Data Structures and Algorithm Using C++

BTEEV405C	Data Structures and Algorithm Using C++	PEC1	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

5. To providing a strong foundation of fundamental basics of Data Structures and Algorithms and OOP concepts.
6. Demonstrating awareness and fundamental understanding of various applications of Data Structures and Algorithms with C++ approach.
7. Applying relevant data structure and algorithms for problem solving with C++ approach.

Course Outcomes: After completion of the course, students will be able to:

CO1	Demonstrate Object oriented concepts.
CO2	Implement linked list & perform various operations on Linked List.
CO3	Apply the concept of stack & queue for performing the operations.
CO4	Compile trees & graph and traverse to solve a problem.
CO5	Write an algorithm & apply different searching and sorting techniques.

Course Contents

Unit-1 An introduction to C++ & OOP **[08 Hours]**

Concepts C++ Primer

Basic C++ Program, Flow of Execution, Fundamental Data Types, Control Flow, Functions, Pointers, Arrays, Structures, Scope and namespaces.

OOP Concepts

Object Oriented Design principles, Classes, Class Members, Constructors, Destructors, Inheritance and Polymorphism, Standard Template Library (STL), Memory Management using new & delete.

Unit 2 Introduction to Data Structure & Linked List: A C++ implementation **[08 Hours]**

Basic operations of Data Structures, Need, Types, Introduction to Linked List, types, Memory management of linked list, Singly, Doubly, Circular linked lists, Operations: Inserting, Deleting, Updating, and Counting, Reversing a list. Arrays and Linked List comparison.

Unit 3 Stacks & Queues **[08 Hours]**

Stack

The Stack ADT, Memory Representation of stack using array and Link List, Stack Operations. The STL

Stack, A C++ Stack Interface, Stack Applications.

Queue

The Queue ADT, Memory Representation of Queue using array and Link List, Queue Operations. The STL Queue, Types of Queues, A C++ Queue Interface, Queue Applications.

Unit 4 Non Linear Data Structures: Trees & Graphs [08 Hours]

Trees

Basic Tree Terminologies, Binary Tree, Binary Tree Traversal: Inorder, Preorder and Postorder, Binary Search Tree (BST), AVL Tree.

Graphs

Introduction, Graph Definitions & Notations, Graph Representation, Operations on Graphs, Graph Traversals: Depth-First Traversal and Breadth-First Traversal.

Unit 5 Algorithms [08 Hours]

Introduction to Algorithms, Algorithm Analysis-Worst, Average and Best case analysis, Algorithm Complexity: Time & Space Complexity tradeoff.

Types of Algorithms:

Array Based Sorting: Bubble Sort, Insertion sort, Quick Sort, Selection sort.

Array Based Searching: Sequential and binary searches. Hashing Schemes.

Text Books:

1. Data Structures using C++, Special Edition-MRCET, Tata McGraw-Hill Publishers 2017.
2. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

References:

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd. Second Edition.
3. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
4. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
5. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

COURSE CURRICULUM MAPPING WITH MOOC PLATFORM NPTEL

Sr. No	Name of Subject as per Curriculum	Course Code	Semester	SWAYAM/ NPTEL Course And Web Link	Name of Institute offering course	Relevance %	Duration of Course
1	Data Structures & Algorithm Using C++			Programming in Modern C++	IIT Kharagpur	40	12 Weeks

Second Year (Semester-IV)

Sensors and Actuators

BTEEV405D	Sensors and Actuators	PEC1	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1	To explain the basic phenomena that defines the behavior of sensors and actuators.
2	To create analytical design and develop solutions using sensors and actuators for Industrial Instrumentation.

Course Outcomes: After completion of the course, students will be able to:

CO1	Explain the behavior of sensors and actuators.
CO2	Understand the working principles of various sensors and selection criteria, signal transmission methods of sensors.
CO3	Comprehend the definition, various types, and selection criteria of actuators
CO4	Explore the principles, examples, and applications of micro sensors and micro actuators
CO5	Use Sensors and Actuators in diverse industrial and agricultural applications.

UNIT 1: TRANSDUCER [09 Hours]

Block diagram of Instrumentation System, Working principle of transducers, classification, LVDT, RVDT.

Capacitive transducers: - Principle of operation, construction details, characteristics of capacitive transducers: capacitive microphone, capacitive pressure sensor, Piezo-electric transducer

UNIT 2: SENSORS [08 Hours]

Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics, Signal transmission - Types of signal, Electronic Signals.

Sensors & its working principle: Proximity, ultrasonic, Pressure, Temperature, Humidity, potentiometer, Hot-wire anemometer, Photo-resistive sensor.

UNIT 3: ACTUATORS [07 Hours]

Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators,

Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors, AC motors - Single phase & 3 Phase Induction Motor; Stepper motors.

UNIT 4: MICRO SENSORS AND MICRO ACTUATORS [08 Hours]

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and

flow micro sensors.

Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect.

UNIT 5: Industrial and Agricultural Applications [08 Hours]

Humidity Measurement, Soil moisture and temperature, smoke and fire detection, burglar alarm, object counter level measurement, on /off timers, RTC, liquid level measurement, surveillance system, latest trends in sensors and actuators.

TEXT BOOKS

1. Patranabis.D, "Sensors and Transducers", Wheeler publisher, 1994.
2. Sergej Fatikow and Ulrich Rembold, "Microsystem Technology and Microbotics", First edition, Springer –Verlag NEwyork, Inc, 1997.
3. Jacob Fraden, "Hand Book of Modern Sensors: Physics, Designs andApplication" Fourth edition, Springer, 2010.

Reference Books:

1. Liptak, "Instrument Engineers Handbook Process Control", Elsevier exclusive; 3rd Edition.
2. John G. Webster, "Instrumentation and Sensors Handbook", CRC Press, 1st Edition, 1999.
3. A. Bahga, V. Madisetti, "Internet of Things A Hands-on Approach" Hands-on Approach Text book, 1st Edition
4. B.C. Nakra, K.K. Chaudhary, "Instrumentation, Measurement and Analysis", McGraw Hill Education India Private Limited, 4th Edition.
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, "Instrumentation: Devices and System", TMH, 2nd Edition, 1983.

Second Year (Semester-IV)

Digital System Design using HDL

BTEEV406	Digital System Design using HDL	LC4	0L-0T-2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

Digital System Design using HDL Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Design of half adder and full adder using Gates.
2. Design of 3-bit counter.
3. Design of sequence generator and sequence detector.
4. Design of Half / Full Adder using Data Flow / Behavioral modelling style in VHDL.
5. Implement 1-bit Full Adder using Structural modelling style in VHDL.
6. Design of Multiplexer (8:1) using VHDL.
7. Implement Priority Encoder using VHDL.
8. Implement Decoder (3:8) using VHDL.
9. Design BCD to 7 segment decoder using VHDL.
10. Implement negative edge triggered D Flip-Flop using VHDL.
11. Implement Synchronous Binary Up Counter using VHDL
12. Develop a program for combinational circuit and implement it using FPGA development board.
13. Develop a program for sequential circuit and implement it using FPGA development board.

Second Year (Semester-IV)

Analog Circuits Lab

BTEEV407	**Analog Circuits Lab**	**LC5**	**0L-0T-2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

Analog Circuits Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. To Measure Op-Amp parameters and compare with the specifications (Input bias current, input offset current and input offset voltage, Slew rate, CMRR).
2. To design inverting amplifier using IC 741.
3. To design non-inverting amplifier using IC 741.
4. To study and perform integrator for given frequency f_a.
5. To study and perform three Op-Amp instrumentation amplifiers for typical application.
6. To design Differentiator circuit using IC-741.
7. To design Integrator circuit using IC-741.
8. To study and perform Schmitt trigger and plot transfer characteristics.
9. To study and perform square & triangular wave generator using op-amp.
10. To verify and understand practically virtual ground and virtual short concept in inverting and non-inverting configuration.
11. Plot DC transfer characteristics of emitter coupled differential amplifier.
12. Study effect of emitter resistance and constant current source on figure of merit. (CMRR) of emitter coupled differential amplifier.
13. To study and perform V-I converter.
14. Study and perform practical based on astable multi vibrator using IC555 for the given specifications.
15. Study and perform practical based on monostable multivibrator using IC555 for the given specifications.
16. Mini-project.

Second Year (Semester-IV)

PEC-1 Lab (Practical's based on Professional Elective Course-1)

BTEEV408	**PEC-1 Lab (Practical's based on Professional Elective Course-1)**	**LC6**	**0L-0T-2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

****Following are the sample list of experiments based on contents of Professional Elective Course-I (PEC-I)**

PEC-I Lab

(A). Analog and Digital Communication Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Study and perform practical based on Amplitude modulation and demodulation.
2. Study and perform practical based on Frequency modulation and demodulation.
3. Study and perform practical based Generation of DSB-SC by using balanced modulator.
4. Study and perform practical based on SSB-SC Modulator & Detector.
5. Study the operation of a super heterodyne receiver using discrete components or a pre-made kit.
6. Study and perform practical based on Pulse Code Modulation & Demodulation.
7. Study and perform practical based on Time Division Multiplexing & De-multiplexing.
8. Study and perform practical based on Delta Modulation.
9. Study and perform practical based on Amplitude Shift Keying.
10. Study and perform practical based on Frequency Shift Keying.
11. Study and perform practical based on Binary Phase Shift Keying.
12. Study and set up simulations for TDMA, FDMA, and CDMA.
13. Perform practical based on DSSS.
14. Perform practical based on FHSS.
15. Mini-project.

(B). Electrical Measurement and Instrumentation Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Measurement of Self-Inductance by Maxwell's Bridge.
2. Measurement of Self-Inductance by Maxwell's Bridge.
3. To determine accurate Quality Factor of an unknown coil.
4. To determine the capacitance of an unknown capacitor.
5. Study of Potentiometer as Error detector
6. Study of AC/DC Position servo system
7. Study of Potentiometer Displacement Transducers.
8. Study of Strain Gauge
9. Temperature measurement using thermistor & thermocouple
10. Study of Burglar Alarm
11. Sound level measurement using digital meter
12. Mini-project.

(C) Data Structures and Algorithm Using C++ Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Demonstrate following concepts with C++ approach
    a. Basic C++ Program
    b. Control Flow
2. Demonstrate following concepts with C++ approach
    a. Swap 2 numbers with and without pointers.
    b. Find smallest and largest element in given array.
3. Demonstrate following OOP concepts with C++ approach
    a. Classes, Constructor, Destructor
    b. Memory Management using ***new*** and ***delete***
4. Demonstrate Standard Template Library (STL)
5. Demonstrate Insertion, Deletion, Updating, Display operations on Linked List.
6. Demonstrate various operations on
    a. Stack in C++ STL
    b. Queue in C++ STL
7. Study of various tree definitions.
8. Study of various graph definitions and notations.
9. Demonstrate any two Array based Sorting technique.
10. Demonstrate Array based Sequential and Binary Search.
11. Mini-project.

(D) Sensors and Actuators Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. To study and perform experiment on strain gauge.
2. To study and perform experiment on thermistor.
3. To study and perform experiment on Thermocouple.
4. To study and perform experiment on Characteristics of RTD.
5. To study and perform experiment on Experimental characterization of DC motor.
6. To study and perform experiment on Stepper Motor interfacing.
7. To study and perform experiment on PIR Sensor.
8. To study and perform experiment on the Ultrasonic Sensor.
9. To study and perform experiment on IR sensor.
10. To study and perform experiment on temperature and humidity sensors.
11. To study and perform experiment on liquid level measurement.
12. Mini Project.

Second Year (Semester-IV)
Seminar-II

BTEEV409	**SEMINAR- II**	**Seminar**	**0L-0T-4P**	**2 Credits**

Guidelines for Seminar

The students shall study in group of two members (or individual) on some special topic beyond the scope of the syllabus under the subjects of Electronics Engineering, Computer Science Engineering Artificial Intelligence, Data Science, or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher. The students shall prepare his report and deliver talk on the topic for other studentsof his class in the presence of his guide and internal examiner. The student is permitted to useaudio-visual aids or any other such teaching aids.

Continues Assessment:

The Continues Assessment for this head will consists of the report written in a technical reporting manner and presentation of the talk on the subject and will be assessed by the internal examiner appointed by the HOD of concern department of the institution.

Second Year (Semester-IV)
Internship – II

BTEEV410	**Internship – II**	**Internship**	**Audit**

Guidelines for Internships

Guidelines for Field Training / Internship / Industrial Training Industrial Training:

8. To apply for a suitable Industrial Training, submit an application form to respective Organization concerned one semester before the Industrial Training Programmed commences.
9. Student can also apply through online platforms such as Internshala for industrial training.
10. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).
11. To complete the Industrial Training process within the specified time based on the Industrial Training Programme schedule.
12. Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Program.
13. Evaluation of the students' performance should be done in the next upcoming semester.
14. Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.